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## RESEARCH MEMORANDUM

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# MANPOWER AND WORKLOAD FACTORS THAT DOMINATE NAVY INDIVIDUAL TRAINING COSTS

Robert W. Downey

JUL 21 1987

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2. This research memorandum is the final report of a study on the factors that affect the costs of training Navy personnel. It identifies the relationship between students undergoing specialized skill training and the dominant operating costs of conducting that training.



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# MANPOWER AND WORKLOAD FACTORS THAT DOMINATE NAVY INDIVIDUAL TRAINING COSTS

Robert W. Downey

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#### ABSTRACT

This research memorandum is the final report on a study of the factors that affect the costs of training Navy personnel. It identifies the relationship between students undergoing specialized skill training and the dominant operating costs of conducting that training.

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Fig. A

## INTRODUCTION AND SUMMARY

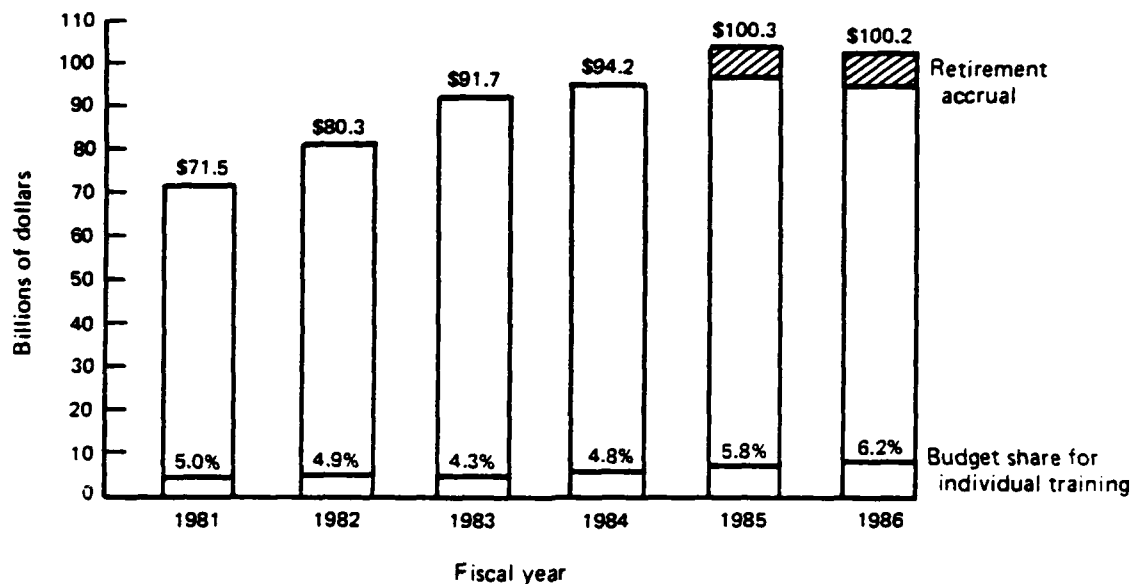
In the early 1980s, the Navy embarked on a series of large investments intended to improve the quality of life for its sailors and improve retention. There were predictions of a payoff in reduced training needs and costs because trained personnel would be retained in the force. As the investment began to take effect, retention did improve, but the expected savings in training costs did not appear to be materializing. Instead, training seemed to be on the increase, and training costs appeared to be going up rather than down. The Deputy Chief of Naval Operations for Manpower, Personnel, and Training asked CNA to investigate this apparent contradiction by analyzing the factors that affect Navy training costs.

The study was done in two phases. The first phase analyzed changes in the amount, duration, and composition of specialized skill training to identify the factors that could be related to changes in costs. The results of this phase of the study are reported in a recent CNA Research Memorandum [4]. The second phase developed disaggregated costs for specialized skill training consistent with the student data developed in the first phase. By relating changes in the student load and the composition of training to the trends in budgets and manpower, it was possible to identify factors that drive training costs and to suggest improved ways of relating the resource input to training output. The results of this second phase are presented in this paper. The basic historical cost data for Navy individual training and some observations on trends in the total costs of training are presented in a previous paper. <

### Training Costs and the Total Department of the Navy Budget

While the study focused primarily on specialized skill training, a brief review of historical trends in overall Navy training costs, which was a significant element of the overall tasking, provides an introductory perspective on the trends of training costs as they relate to the total Navy budget.

Figure 1 summarizes the Department of the Navy budget from FY 1981 through FY 1986, in constant FY 1986 dollars. Superimposed is the cost of training. The shaded sectors represent the add-on to the Navy budget resulting from a change in the financing of military retirement pay. Starting in FY 1985, retirement pay was required to be financed through a system of accrual financing in the military departments' appropriations rather than in a single DOD appropriation. This accounting change alone caused an increase of just over \$5 billion in the Navy budget. While this change represents only slightly more than a 5 percent increase in the overall Navy budget, it means an increase of about 40 percent in the average annual cost of military personnel. It further means that the cost of programs that are military manpower intensive--as Navy training programs are--are strongly affected by that accounting change.



SOURCE: Office of the Assistant Secretary of Defense (Comptroller),  
National Defense budget estimates of FY 1986.

**FIG. 1: DEPARTMENT OF THE NAVY BUDGET, FY 1981 – FY 1986,  
AND BUDGET SHARE FOR INDIVIDUAL TRAINING  
(CONSTANT FY 1986 DOLLARS)**

The second piece of information provided in figure 1 is an estimate of the share of the overall Navy budget that has been devoted to individual training. The data indicate that this share has been fairly steady, ranging from 5 percent in FY 1981 to 6.2 percent in FY 1986. The increases in FY 1985 and FY 1986 were largely attributable to the change in retired pay funding.

The programmatic composition of training costs is displayed in table 1 for each of the major training categories from FY 1981 through FY 1986. Comparable data on those costs for each of the Navy appropriations are found in table 2.

#### Summary

The analysis of factors affecting specialized skill training costs concentrates on the annual costs of conducting the training. These include the training costs that fall under the Operation and Maintenance, Navy (O&MN) appropriation plus the military personnel costs associated with the training staffs. Comparison of student training loads and those costs demonstrates that some earlier assumptions about training cost increases from FY 1981 to FY 1986 were based on data that included major accounting changes and the effects of inflation. This study used

TABLE 1

NAVY TRAINING COSTS BY TRAINING CATEGORY, FY 1981-86  
(Millions of FY 1986 dollars)

Training category	Actual					Estimated
	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986
Recruit training	332.3	320.6	262.7	291.7	494.4	526.0
Specialized skill training	1,074.7	1,182.7	1,195.0	1,567.4	2,097.2	2,252.9
Flight training	672.5	731.1	747.7	746.3	906.8	945.8
Officer acquisition	163.3	179.0	187.6	204.4	253.7	258.6
Health care training	111.4	115.4	111.0	120.5	151.3	167.3
Professional education and development	78.5	84.2	93.7	101.4	152.5	153.7
Educational development programs	49.2	55.7	65.5	66.1	76.6	83.4
Training support	400.6	522.6	504.8	639.1	803.3	1,013.1
Base support	542.3	547.8	559.8	605.2	751.8	706.0
PCS travel	<u>135.2</u>	<u>196.0</u>	<u>198.9</u>	<u>163.0</u>	<u>138.6</u>	<u>168.3</u>
Total	3,560.0	3,935.1	3,926.7	4,505.1	5,826.2	6,275.1

TABLE 2

NAVY TRAINING COSTS BY APPROPRIATION TITLE, FY 1981-86  
(Millions of FY 1986 dollars)

Appropriation title	Actual					Estimated
	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986
Military Personnel, Navy	2,154.0	2,262.7	2,105.2	2,184.5	3,238.4	3,225.9
Reserve Personnel, Navy	72.2	72.3	92.0	122.0	203.9	202.8
Operation and Maintenance, Navy	1,011.5	1,150.4	1,197.4	1,286.9	1,556.9	1,625.7
Aircraft Procurement, Navy	194.3	190.1	224.4	240.0	198.6	182.2
Weapons Procurement, Navy	3.3	0.6	2.8	13.1	30.3	2.9
Shipbuilding and Conversion, Navy	33.4	9.0	7.2	65.7	13.1	22.1
Other Procurement, Navy	40.9	49.9	140.3	293.7	243.6	453.1
Research, Development, Test, and Evaluation, Navy	44.9	46.5	46.4	109.3	192.3	255.1
Military Construction, Navy	47.5	117.5	95.1	167.5	136.4	291.6
Military Construction, Navy Reserve	18.5	9.0	1.8	10.2	22.3	13.8
Total	3,620.5	3,908.0	3,912.6	4,492.9	5,835.8	6,275.2

costs that are expressed in constant 1986 dollars and that eliminate the effects of those accounting changes so as to present a consistent cost series. The resulting cost trends are shown in figure 2.

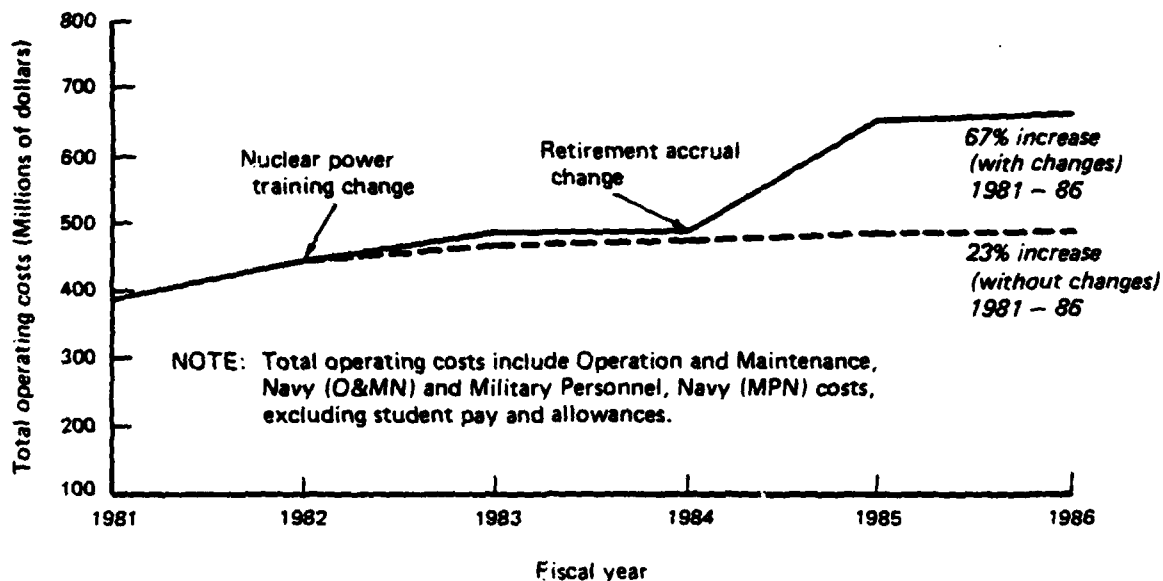


FIG. 2: NAVY SPECIALIZED SKILL TRAINING: TOTAL OPERATING COSTS AND EFFECT OF BUDGET CHANGES, FY 1981 - FY 1986 (CONSTANT FY 1986 DOLLARS)

Using this approach to costing, the study concludes that the costs of specialized skill training increased by 23 percent from FY 1981 to FY 1986. This change matched the increase in the number of students being trained. Figure 3 displays the trends in costs per student for each type of school and for specialized skill training as a whole. The flatness of the trend lines means that costs per student have remained fairly constant.

The increase in the number of students undergoing specialized skill training occurred at a time when the Navy's end strength was also growing, as indicated in the left-hand graph in figure 4. But that does not account for all of the increased student load. As shown in the right-hand graph in figure 4, the percentage of Navy personnel taking specialized skill training also increased slightly during this period from about 8 percent to about 9 percent, suggesting that other factors were at work.

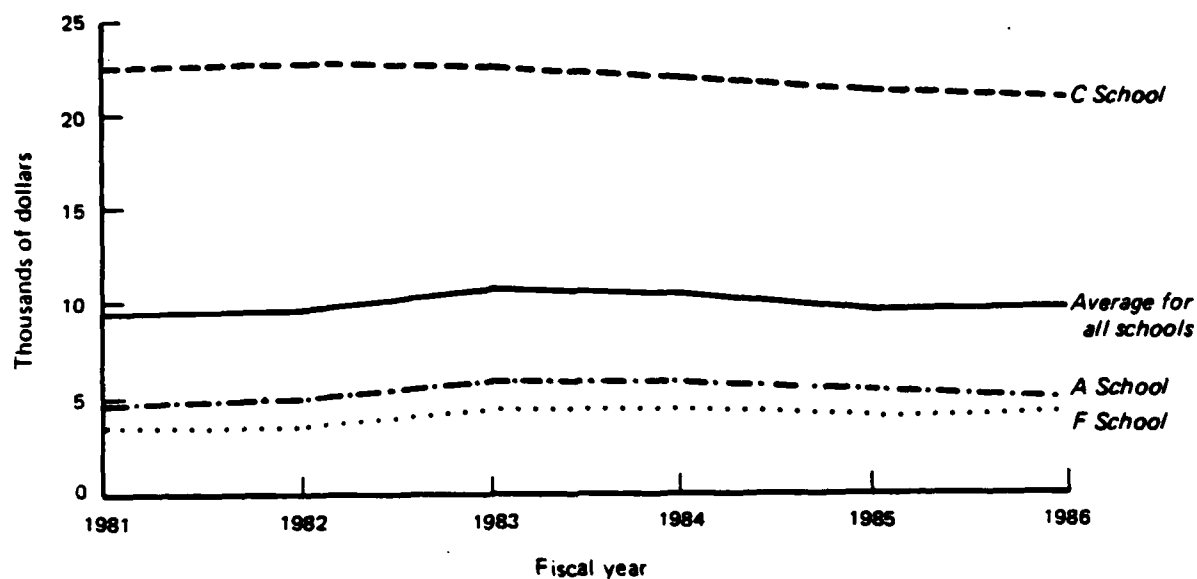


FIG. 3: SPECIALIZED SKILL TRAINING: COST PER STUDENT  
(CONSTANT 1986 DOLLARS)

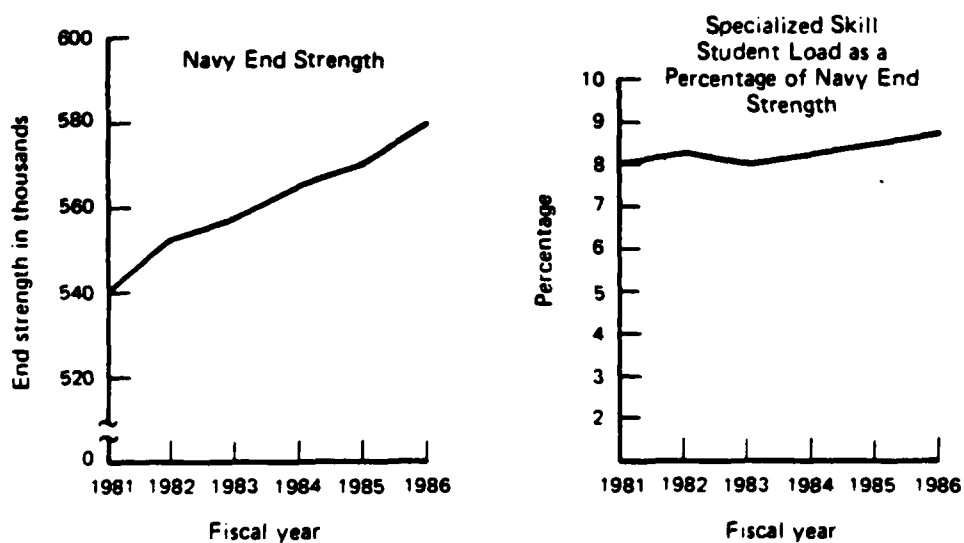


FIG. 4: RELATIONSHIP OF SPECIALIZED SKILL TRAINING  
TO NAVY END STRENGTH

Finally, the study notes that a major factor impacting Navy training costs is the number of instructors, predominantly military personnel, as driven by the training student load.

The costs attributed to training should also include the costs associated with the facilities used (classrooms, barracks, mess halls, etc.). Those costs, however, could not be analyzed in this study since they are currently identified only in total and not broken down by training categories.

The report observes that in considering the overall cost of training it is necessary to take into account student loads, instructors, and direct training costs as was done in this study, and that the costs of training facilities should be added when available. It suggests that including such data in budget material would improve the presentation and explanation of the Navy's training programs and budgets.

#### A BRIEF REVIEW OF THE NAVY TRAINING BUDGET AND RELATED PROGRAM DATA

##### Training Categories

Navy individual training, as distinct from fleet or unit training, is made up of several specific categories:

- Recruit training
- Specialized skill training
- Flight training
- Officer acquisition
- Health care training
- Professional education and development
- Educational development programs
- Training support
- Base support.

These are the categories in which the Navy training authorizations and budgets are presented both internally and to the Congress. The primary focus of this report will be on specialized skill training. While the title "specialized skill training" is used only in reference to a segment of the Navy operation and maintenance budget, it is used here to cover all budget costs associated with that training category.

### Specialized Skill Training Schools

Specialized skill training is conducted at three types of schools: A schools, C schools, and F schools. A schools provide initial skill training following recruit training. This training leads to an occupational qualification (rating) or apprenticeship training. C schools provide advanced or more specific skill training, often leading to the award of a Navy Enlisted Classification (NEC). F schools provide for functional training (such as firefighting), usually in short courses.

Most of these schools are under the control of the Chief of Naval Education and Training and his functional commanders: Chief of Naval Technical Training; Commander, Naval Training Command, Atlantic; and Commander, Naval Training Command, Pacific. Other specialized schools are run by the Commander, Naval Medical Command; Commander, Navy Recruiting Command; and the Navy Judge Advocate General.

### Measures of Training for Specialized Skill

The measure of training workload, both in terms of the training authorization and as displayed in the budget, is based on a computation of the average number of students in training on a given day. This measure is referred to as the average-on-board (AOB) count and is used for most forms of individual training. It is also sometimes called the "student load"--a term that can have several connotations. The total student load refers to all of the students enrolled in courses, including both Navy and non-Navy people, and both those under instruction and those awaiting instruction. Students under instruction include only those actually under instruction and not those who are awaiting instruction or awaiting orders to their next duty station.

The student load data used in the first study task covered Navy enlisted students only. The examination of training costs, however, required inclusion of all students, including officers and people from other services and agencies, to capture a complete measure of classroom workload.

### Operations Costs vs. Total Costs

An earlier CNA paper presented a comprehensive set of costs associated with Navy individual training. It covered each of the training categories and included costs from all of the Navy's appropriations that could be reasonably associated with training. This present review of specialized skill training and the relationship between student load and training costs focuses only on those costs that bear directly on the training operations--namely, the Operation and Maintenance, Navy (O&MN) costs and Military Personnel, Navy (MPN) costs. The costs of major investment, long-term research and development, and military construction, while essential to the conduct of training, can be only indirectly related to the day-to-day operation of the training establishment and

the annual student loads. In addition, while the total costs of training include those investment items, as well as the costs of the students themselves, the analyses that follow address only the costs of operating the training establishment and exclude student pay and allowances. The purpose in looking only at operating costs is to focus on the annual input to the training establishment and attempt to relate those costs to the annual student load and output.

#### Training Operations Cost Elements

In considering the costs of Navy specialized skill training, it is useful to understand the content of the section of the Navy budget where specialized skill training is most completely described. The identifiable costs of specialized skill training are contained in the O&MN appropriation under Budget Activity 8--Training, Medical, and Other General Personnel Activities. The training subset of that activity is further identified to an activity group (AG) called "Specialized Skill Training."

This activity group covers the O&MN costs associated with specialized training primarily under the control of the Chief of Naval Education and Training. Its major elements are:

- Civilian personnel staff salaries and benefits
- Costs associated with contract instructors
- Stock fund supplies and materials
- Contract maintenance and repair services
- Printing and reproduction services
- Minor equipment purchases.

Other O&MN costs that are not included under the specialized skill activity group are found in a section of Budget Activity 8 called "Base Operations." These costs include:

- Operation and maintenance of school facilities (barracks, mess halls, dispensaries, etc.)
- Grounds and facilities maintenance
- Utilities
- Maintenance and repair of real property
- Base support services and supplies.

The base operations costs are carried under the one budget aggregation for all categories of training rather than being associated with specific training categories. Subsequent cost data in this report will not include these costs; however, suggestions for identifying these base support costs and relating them to the specific training categories will be offered.

The training budget data include summary financial data for the budget year, the current year, and the last complete actual year and are further associated with the three major subcategories of training: initial skill (A school), skill progression (C school), and functional training (F school).

The training budget also provides three-year information on the students undergoing training expressed as total student entrants, graduates, and student loads. Recent budgets break down the student load data by A, C, and F schools.

In addition, the training budget provides three-year data on the total numbers of officers, enlisted personnel, and civilian personnel assigned to specialized skill training (including students, instructors, and staff). The training manpower data are not broken down by type of school.

#### Medical Budget Costs for Specialized Skill Training

There is another set of resources that contribute to specialized skill training as it is defined by the Military Manpower Training Reporting (MMTR) system. These are the resources associated with health care education and training, which are included in the Medical section of Budget Activity 8 of the O&MN budget. Table 3 summarizes the financial data for these O&MN cost components of the specialized skill training budget for FY 1981 and FY 1985 that are managed by CNET and the Naval Medical Command (MEDCOM). In developing estimates of the operating costs of specialized skill training, the sums of the CNET and MEDCOM costs constitute the O&MN estimates shown in table 3.

#### DEVELOPMENT OF TRAINING COSTS AND RELATED MANPOWER DATA

The costs that were used in reviewing specialized skill training operations include:

- The direct O&MN costs associated with specialized skill training in the budget
- The O&MN costs found under health care education and training in the O&MN budget that can be associated with specialized skill training
- The costs of the military instructors and staffs who conduct and administer the instruction.

TABLE 3

NAVY SPECIALIZED SKILL TRAINING BUDGET, O&MN  
(Millions of FY 1986 dollars)

	<u>FY 1981</u>	<u>FY 1985</u>
A school		
CNET	34.2	56.7
MEDCOM	1.3	2.4
Total	35.5	59.1
C school		
CNET	38.3	85.5
MEDCOM	1.9	1.9
Total	40.2	87.4
F school (all CNET)		
Total	12.9	16.0
All schools		
CNET	85.4	158.2
MEDCOM	<u>3.2</u>	<u>4.3</u>
Total	88.6	162.5

## MILITARY TRAINING STAFFS AND STUDENT LOAD

The cost element for military training staffs comprises the pay and allowances of the military personnel who conduct the majority of specialized skill courses. Over 14,000 instructors were assigned to specialized skill training in FY 1985, and of those more than 13,500 or 92 percent were military. These instructors and their costs constitute the major components of specialized skill training.

The costs of civilian instructors are included in the overall O&MN budget costs. The costs of the military instructors and military staff, however, are accounted as a part of the overall Military Personnel, Navy (MPN) appropriation and are not regularly associated with training per se. In order to develop those military personnel costs, it was necessary to identify the end strength of military instructors and staff assigned to specialized skill training and to use standard officer and enlisted pay and allowance rates. This information was obtained from CNET, CNTT, the Naval Medical Command, and the Navy Military Personnel Command. The derivation of those military personnel costs is shown in table 4.

TABLE 4

## SPECIALIZED SKILL TRAINING: MILITARY PERSONNEL END STRENGTH AND COSTS FOR INSTRUCTORS AND STAFF (CNET and MEDCOM)

	Pay and allowances--unit costs <sup>a</sup>			
	FY 1981		FY 1985	
	Current \$	Constant 86 \$ <sup>b</sup>	Current \$	Constant 86 \$ <sup>b</sup>
Officer	30,813	40,877	53,469	56,277
Enlisted	13,473	17,873	23,575	24,813
Pay and allowances--by type of school				
	FY 1981		FY 1985	
	End strength	\$ (millions)	End strength	\$ (millions)
A school				
Officer	396	16,187	422	23,749
Enlisted	3,845	68,721	3,866	95,927
Total	4,241	84,908	4,288	119,676
C school				
Officer	1,047	42,798	1,231	69,277
Enlisted	9,927	177,425	11,876	294,679
Total	10,974	220,223	13,107	363,956
F school				
Officer	19	777	17	957
Enlisted	35	626	85	2,118
Total	54	1,403	102	3,075

a. Source: Navy Military Personnel Command--NMPC-7.

b. Deflator obtained from National Defense Budget Estimates--FY 1986; and OASD Comptroller--March 1985.

### Development of Training Operations Costs

From those sets of data, it was possible to develop the data series covering the operating costs as shown in table 5 for specialized skill training. The O&MN and MPN costs are totaled to reflect the actual budget content of those periods--expressed in constant 1986 dollars.

TABLE 5

SPECIALIZED SKILL TRAINING: DIRECT OPERATING PRODUCTION COSTS  
FOR A, C, AND F SCHOOLS, FY 1981 VERSUS FY 1985<sup>a</sup>  
(Millions of constant FY 1986 dollars)

	<u>FY 1981</u>	<u>FY 1985</u>	<u>Increase (FY 1981-85)</u>
A school			
Military Personnel, Navy	84.9	119.7	+ 34.8
Operation and Maintenance, Navy	<u>35.3</u>	<u>59.1</u>	<u>+ 23.8</u>
Total	120.2	178.8	+ 58.6
C school			
Military Personnel, Navy	220.2	364.0	+ 143.8
Operation and Maintenance, Navy	<u>40.2</u>	<u>87.4</u>	<u>+ 47.2</u>
Total	260.4	451.4	+ 191.0
F school			
Military Personnel, Navy	1.4	3.1	+ 1.7
Operation and Maintenance, Navy	<u>12.9</u>	<u>16.0</u>	<u>+ 3.1</u>
Total	14.3	19.1	+ 4.8
All schools			
Military Personnel, Navy	306.5	486.8	+ 180.3
Operation and Maintenance, Navy	<u>88.6</u>	<u>162.5</u>	<u>+ 73.9</u>
Total	395.1	649.3	+ 254.2

a. Excludes pay and allowances for students.

A comparison of the two years--FY 1981 and FY 1985--shows a large increase in budget levels for specialized skill training. The primary reason for the increases is found in the accounting changes that took place during that time period. One had to do with an increase in the Navy costs of nuclear power training; the other was the change in

budgeting for retired pay, mentioned earlier. Since those changes arose from policy decisions rather than changes in the content of training, the detailed budget costs that follow will be presented in a way that eliminates the effect of those changes and, therefore, provides a more consistent set of resource levels for specialized skill training for FY 1981 to FY 1986.

#### Student Load and Its Relationship to Training Costs

The final step in the cost and student load analysis involved the development of student load data that better measured the training activity at specialized skill schools. The measure initially selected was the one found in the budget justification books under the heading "Performance Criteria and Evaluation." Several important modifications to that measure were required to make it more consistent with the output or product of the training. First, in order to focus on the actual instructional activity in terms of instructors as well as dollars, it was necessary to separate those students under instruction from those awaiting training or having completed training and awaiting orders. Second, in comparing the student load found in the budget to the total student loads in the Military Manpower Training Report (MMTR) it was necessary to ensure that the medical training student load and the CNET student load were considered as a part of specialized skill student load.

Table 6 compares the specialized skill training student loads in FY 1981 and FY 1985. It displays the total student load for specialized skill training and then identifies the student load relating to the students who are actually under instruction. From FY 1981 to FY 1985, the total student load increased by less than 4 percent. However, the number of students under instruction increased by over 12 percent. A closer look at those student loads by type of school indicates a sharper increase in the more complex C school training (25 percent) than occurred in the A and F schools. Such a disaggregation of cost and student load data within specialized skill training reveals trends that are masked when only aggregate student load is considered.

#### Training Manpower and Student Load--A Summary

Table 7 summarizes the training manpower (instructor and staff) and student load for specialized skill training in FY 1981 and FY 1985.

TABLE 6

SPECIALIZED SKILL TRAINING: DERIVATION OF STUDENT TRAINING LOAD  
AS STUDENTS UNDER INSTRUCTION

	<u>FY 1981</u>	<u>FY 1985</u>	<u>Difference</u> <u>(FY 1981-85)</u>	<u>Percent</u> <u>difference</u> <u>(FY 1981-85)</u>
Total workload	52,640	54,644	+ 2,004	+ 3.8%
Less supernumeraries	- 10,751	- 7,433	- 3,318	- 3.1%
Total students under instruction	41,889	47,211	+ 5,322	+ 12.7%
Officers under instruction				
A school	1,477	1,419	- 58	- 3.9%
C school	1,035	1,364	+ 329	+ 31.8%
F school	<u>699</u>	<u>857</u>	<u>+ 158</u>	<u>+ 22.6%</u>
Total	3,211	3,640	+ 429	+ 13.4%
Enlisted under instruction				
A school	24,404	26,401	+ 1,997	+ 8.2%
C school	10,620	13,248	+ 2,628	+ 24.7%
F school	<u>3,654</u>	<u>3,922</u>	<u>+ 268</u>	<u>+ 7.3%</u>
Total	38,678	43,571	+ 4,893	+ 12.7%
All students under instruction				
A school	25,881	27,820	+ 1,939	+ 7.5%
C school	11,655	14,612	+ 2,957	+ 25.4%
F school	<u>4,353</u>	<u>4,779</u>	<u>+ 426</u>	<u>+ 9.9%</u>
Total	41,889	47,211	+ 5,322	+ 12.7%

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SOURCE: Military Manpower Training Reports, FY 1983 and FY 1987.

TABLE 7

SPECIALIZED SKILL TRAINING SCHOOLS: TOTAL OPERATING  
MANPOWER RESOURCES AND STUDENT LOAD

	<u>FY 1981</u>	<u>FY 1985</u>	<u>Change (FY 1981-85)</u>
<u>Manpower</u>			
Military instructors (MPN)	11,936	13,556	+ 1,620
Contract instructors (O&MN)	509	1,048	+ 539
Civil service instructors (O&MN)	<u>81</u>	<u>69</u>	<u>- 12</u>
Total	12,526	14,673	+ 2,147
<u>School staffs</u>			
Civil service	710	697	- 13
Military	<u>3,333</u>	<u>3,941</u>	<u>+ 608</u>
Total	4,043	4,638	+ 595
<u>Student load</u>			
Total student load	52,640	54,644	+ 2,004
Total students under instruction	41,889	47,211	+ 5,322

Identification of Training Manpower and Student Load Data by Type of School

The next step involves disaggregating the data down to each discrete type of skill training. This involved generating both training manpower and student load data for the A schools, C schools, and F schools, since that kind of information is not now available in either the programming or budgeting systems. Earlier data systems that collected information on military instructors by type of school, for example, have been discontinued. While such data are maintained at the schools and at some intermediate command levels, they are not in general use for budgeting or programming purposes. Estimates for the numbers and costs of instructors in this paper are based on information obtained from several sources in CNET and CNTT and the Naval Military Personnel Command.

Table 8 displays the distribution of instructors and staff by type of school for FY 1981 and FY 1985, so as to describe and highlight major changes in the training establishment.

TABLE 8  
INSTRUCTIONAL STAFF AND STUDENT LOAD (STUDENT YEARS)

	<u>FY 1981</u>	<u>FY 1985</u>	<u>Change (FY 1981-85)</u>
A school instructors			
Military	3,686	3,695	+ 9
Contract	307	776	+ 469
Civil service	<u>42</u>	<u>46</u>	<u>+ 4</u>
Total	4,035	4,517	+ 482
Student years	25,881	27,820	+ 1,939
Ratio: student/instructor	6.41:1	6.16:1	
C school instructors			
Military	8,208	9,782	+ 1,574
Contract	202	266	+ 64
Civil service	<u>33</u>	<u>16</u>	<u>- 17</u>
Total	8,443	10,064	+ 1,621
Student years	11,655	14,612	+ 2,957
Ratio: student/instructor	1.38:1	1.45:1	
F school instructors			
Military	42	79	+ 37
Contract	0	6	+ 6
Civil service	<u>6</u>	<u>7</u>	<u>+ 1</u>
Total	48	92	+ 44
Student years	4,353	4,779	+ 426

Table 8 also provides information on student load, expressed as students under instruction for that same period. In addition, ratios between student years and instructors for A schools and C schools are provided. Student/instructor ratios for F schools are not provided since the nature and duration of the F school make such a calculation questionable.

#### ANALYSIS OF THE STUDENT LOAD, STAFF, AND COST COMPONENTS OF SPECIALIZED SKILL TRAINING

Since specialized skill was the training category of particular interest in the study, the cost and student load profiles for that category over the FY 1981 to FY 1986 time period are now considered in

greater detail. Trends in costs, training, manpower, and student load are examined over the 6-year period from FY 1981 to FY 1986. Figure 5 demonstrates that the total resources associated with specialized skill training stayed within a relatively narrow range as a share of total Navy training and of the overall Navy budget, except for the policy changes discussed earlier. To better understand the relationship among the factors that drive specialized skill training costs, an analysis of training operations that relates student load, training manpower, and costs is the next step.

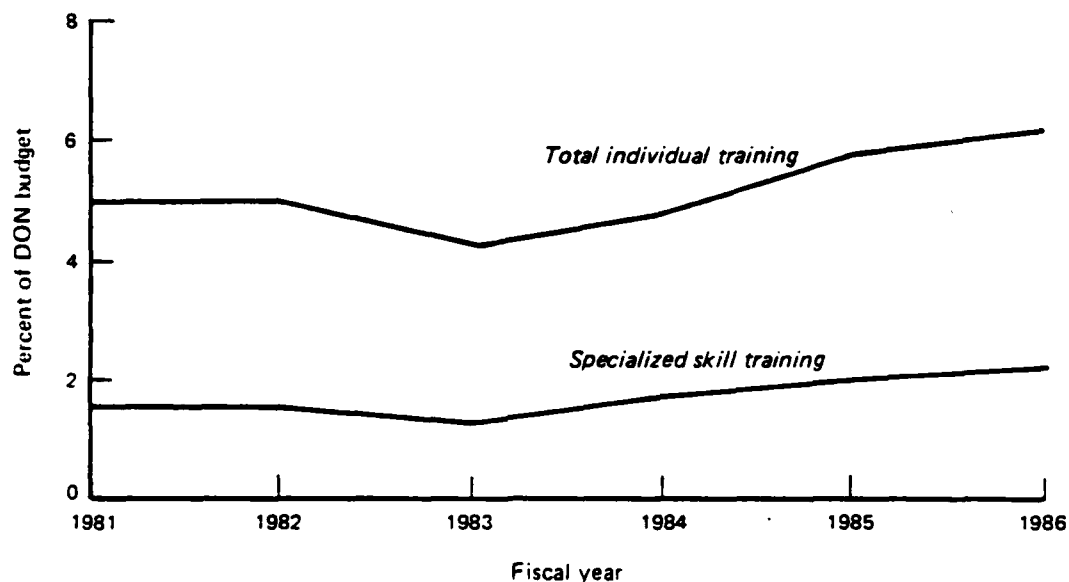


FIG. 5: TOTAL INDIVIDUAL TRAINING COSTS AS A SHARE OF THE DON BUDGET - ALL APPROPRIATIONS

#### Student Load Patterns for A, C, and F Schools

The first of those elements of training is the student load. The student load patterns for the FY 1981-86 period were examined to show the changes that have taken place. Figure 6 depicts the trends in the numbers of students actually under instruction during that period, by type of school. The data make it clear that there has been a significant increase in the numbers of students under instruction in specialized skill training, most notably in the skill progression or C schools.

The measure of student load used here covers a slightly different and larger student population than was considered in [1]. The same method of average-on-board counting student loads is used, but all

students--officer and enlisted--from all services and sources are included in order to be consistent with the total manpower and cost data for that training. The earlier analysis in [1] focused only on Navy enlisted personnel in relating the population and the master personnel record data to the composition and duration of specialized skill training. However, it will be seen that the overall trends in student load are consistent with the trends reported in [1].

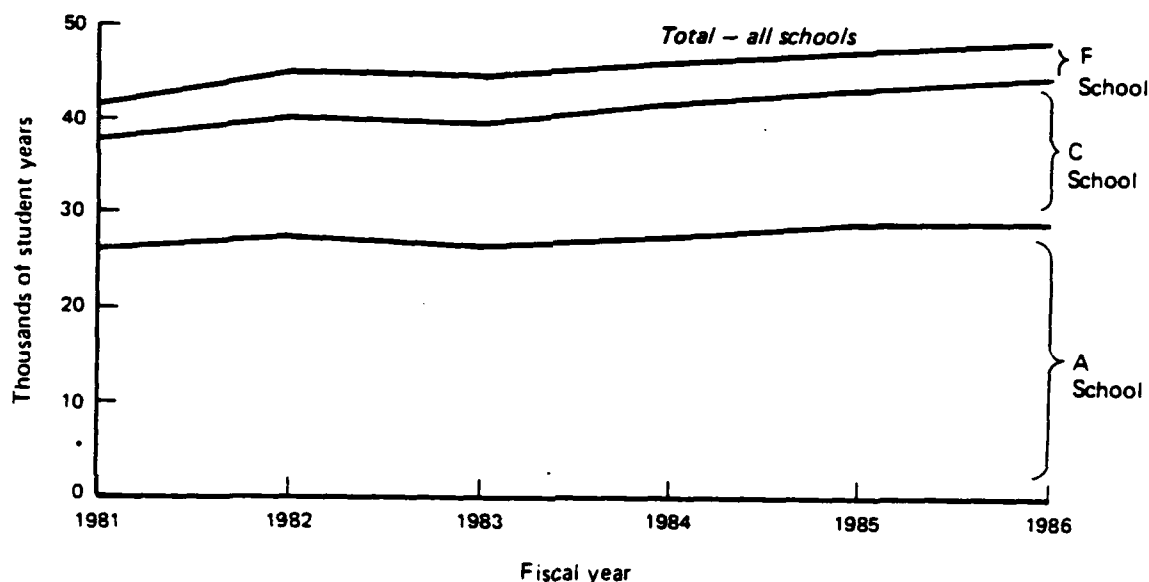


FIG. 6: SPECIALIZED SKILL STUDENT LOAD, FY 1981 - FY 1986

#### Staffing of A, C, and F Schools

The next major element of specialized skill training is the manpower employed to conduct the training. This manpower has three components. First is the military manpower, which makes up the largest part of the instructional staff in specialized skill training--over 90 percent of the total instructional staff. These are the Navy officers and enlisted personnel who teach at the training activities. The second component comprises civilian contract instructors, primarily in A schools. Their services are procured on a man-year basis, largely from local educational institutions. Finally, there is a small number of civil service instructors. In addition to instructors, there are administrative and support staffs, both military and civilian, assigned to the training activities.

These manpower assets are displayed in table 9 for the period FY 1981 through FY 1986 by type of school. The details on instructors

TABLE 9  
SPECIALIZED SKILL TRAINING: STAFFING LEVELS

	Actual					Estimated
	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986
A school						
Instructors	4,035	4,327	4,529	4,533	4,517	4,543
Support staff	<u>877</u>	<u>880</u>	<u>883</u>	<u>896</u>	<u>909</u>	<u>914</u>
Total	4,912	5,207	5,412	5,429	5,426	5,457
C school						
Instructors	8,443	9,465	10,215	10,196	10,064	10,807
Support staff	<u>2,993</u>	<u>3,135</u>	<u>3,340</u>	<u>3,495</u>	<u>3,581</u>	<u>3,615</u>
Total	11,436	12,600	13,555	13,691	13,645	14,422
F school						
Instructors	48	50	58	78	92	95
Support staff	<u>158</u>	<u>155</u>	<u>153</u>	<u>150</u>	<u>148</u>	<u>148</u>
Total	206	205	211	228	240	243
All schools						
Instructors	12,526	13,842	14,802	14,807	14,673	15,445
Support staff	<u>4,033</u>	<u>4,170</u>	<u>4,376</u>	<u>4,541</u>	<u>4,638</u>	<u>4,677</u>
Total	16,559	18,012	19,178	19,348	19,311	20,122

and staff from FY 1982 through FY 1984 are estimates based on specific overall manning data for specialized skill training and detailed information on military and civilian instructor allowances for FY 1981 and FY 1985. Staffing trends by type of school are graphically displayed in figure 7.

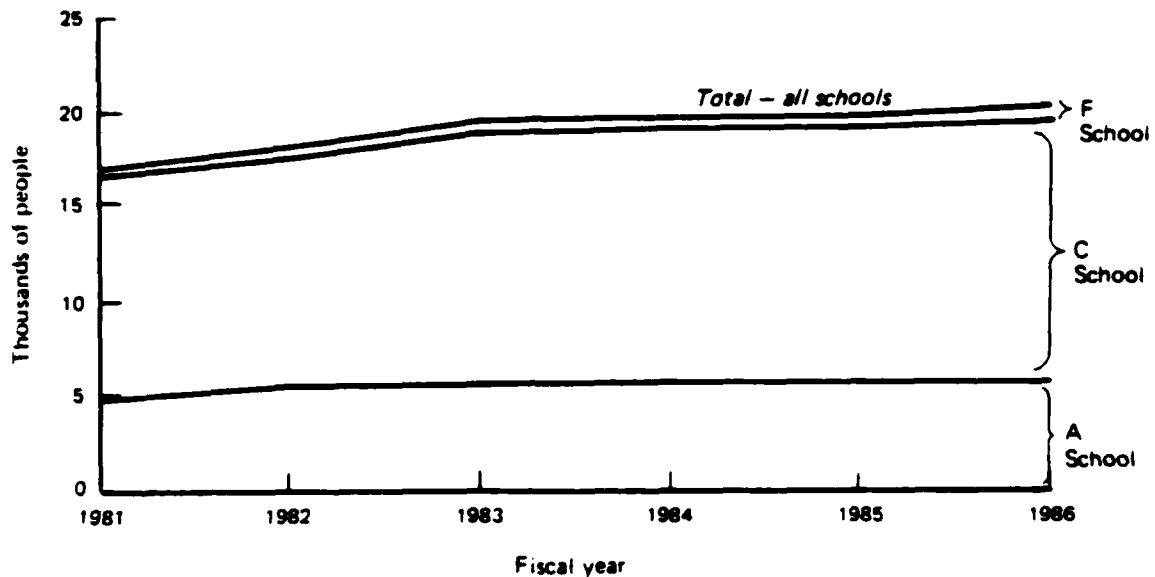


FIG. 7: STAFFING LEVELS FOR SPECIALIZED SKILL TRAINING

#### Annual Training Operations Costs Related to Student Load

As discussed earlier, the student load--the number of students under instruction--and the staffing are the annual measures of the input to specialized skill training. In aligning cost information with these measures, the focus shifts from total costs to the annual operating costs directly involved in the conduct of training. The costs included are the direct O&MN budget costs plus the pay and allowances of military personnel assigned as instructors or staff. Pay and allowances of students are not included.

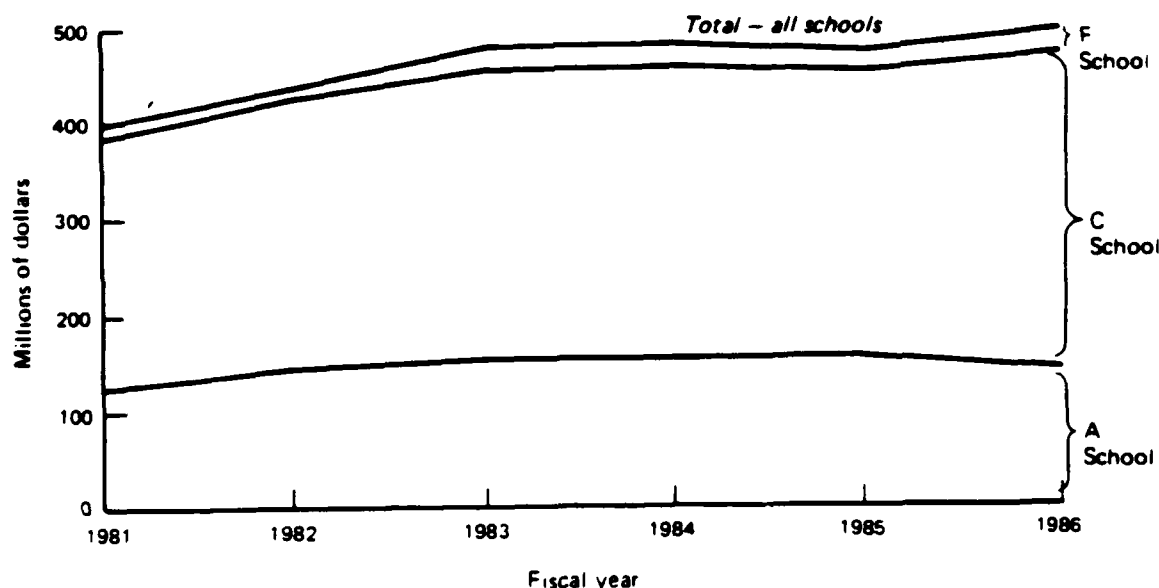
#### Normalization of Specialized Skill Training Costs

Earlier it was pointed out that Navy budget costs during the FY 1981-86 period were influenced by externally imposed accounting policy changes that distorted the trends. There were two major changes of particular concern in developing costs for specialized skill training: the increase in the Navy budget to cover military retirement

costs, and the increase in specialized skill training because of increased charges for nuclear power training by the Department of Energy. While the retirement change affected all military personnel costs throughout the Navy, the effect on specialized skill training was particularly strong because of the preponderance of military personnel in this category. The second change was unique to specialized skill training. Figure 2 presented a graphic representation of the effect of those budgetary changes on costs during the FY 1981-86 time frame.

The change in budgeting for military retirement obviously did not stem from changes in training programs. However, in summarizing training costs--in isolation--the change would be seen as an increase in the cost of training.

To permit analysis of costs on a consistent basis, the cost data were adjusted to exclude those two changes to the Navy budget. The detailed costing by A, C, and F schools, as adjusted to exclude the effects of those changes, appears in table 10. A representation of those adjusted costs appears in figure 8.



NOTE: Operating costs include Operations and Maintenance, Navy (O&MN) costs plus Military Personnel, Navy (MPN) costs, excluding student pay and allowances.

FIG. 8: OPERATING COSTS FOR SPECIALIZED SKILL TRAINING, FY 1981 - FY 1986  
(CONSTANT FY 1986 DOLLARS)

TABLE 10  
SPECIALIZED SKILL TRAINING: OPERATING COSTS, FY 1981-86<sup>a</sup>

	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986	Percent increase (FY 1981-86)
A school							
OMN	35.5	51.8	60.0	56.5	59.1	49.4	
MPN	<u>84.9</u>	<u>86.2</u>	<u>87.0</u>	<u>87.9</u>	<u>87.0</u>	<u>88.1</u>	
Total	120.4	138.0	147.0	144.4	146.1	137.5	14%
C school							
OMN	40.2	40.1	38.9	41.5	42.0	46.0	
MPN	<u>220.2</u>	<u>242.6</u>	<u>263.6</u>	<u>269.4</u>	<u>264.6</u>	<u>283.0</u>	
Total	260.4	282.7	302.5	310.9	306.6	329.0	26%
F school							
OMN	12.9	14.0	17.3	17.8	16.0	17.4	
MPN	<u>1.4</u>	<u>1.5</u>	<u>1.6</u>	<u>2.0</u>	<u>2.2</u>	<u>2.3</u>	
Total	14.3	15.5	18.9	19.8	18.2	19.7	38%
All schools							
OMN	88.6	105.9	116.2	115.8	117.1	112.8	
MPN	<u>306.5</u>	<u>330.3</u>	<u>352.2</u>	<u>359.3</u>	<u>353.8</u>	<u>373.4</u>	
Total	395.1	436.2	468.4	475.1	470.9	486.2	23%

a. FY 1983-86 figures adjusted to eliminate affect of added nuclear power training costs and additional Navy budget cost of retired pay.

### Relationships Between Cost and Student Load Data

The data presented thus far on student load, instruction manpower, and costs begin to show a consistent pattern that points to a close relationship between student load and the total operating costs for specialized skill training. The relationship is most evident in the case of the skill progression or C-school training, where the growth in student load and costs has been most pronounced. The next step is to correlate those data and draw conclusions.

### CORRELATION OF THE DATA AND RESULTS

Table 11 summarizes the population of the students under instruction and the operating costs by type of school and then derives a set of costs per student for each type of school. Table 12 displays student/instructor ratios for each school and for specialized skill training in total. Table 13 finally summarizes these data to bring together the cost per student and the student/instructor ratios by school and for all of specialized skill training.

Two major conclusions can be drawn from these data:

- Training costs per student have changed very little from FY 1981 to FY 1986.
- The student/instructor ratio for specialized skill training has remained relatively constant over that period.

It is noteworthy that the cost per student for C schools has fallen slightly as the number of students per instructors has risen, and that the A-school ratios have gone in the other direction. These findings further attest to the significance of the cost of instructors in the composition of overall training costs.

With respect to the primary purpose of the study, which was to shed light on the factors that affect training costs, the analysis makes it clear that the dominant cost of specialized skill training is the cost of the instructors. Further, since the overwhelming share of the instructors at these schools are military personnel, it is the cost of these military personnel that drives the costs of specialized skill training.

### The Impact of Accounting Changes

The generally held impression that training costs have been increasing can be attributed largely to three costing factors which have masked the underlying trends in training costs. First and foremost was the large policy change to the budget cost of military personnel that resulted from the addition of military retirement costs to the service budgets. The effect of that change was eliminated in this analysis of

TABLE 11

## SPECIALIZED SKILL TRAINING: RELATIONSHIPS BETWEEN COSTS AND STUDENT LOADS

	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986	Increase (FY 1981-86)	Percent increase (FY 1981-86)
<b>Students under instruction</b>								
A school	25,881	27,565	26,276	26,711	27,820	28,109	+ 2,228	8.6%
C school	11,655	12,724	13,581	14,350	14,612	15,738	+ 4,083	35.0%
F school	<u>4,353</u>	<u>4,459</u>	<u>4,436</u>	<u>4,575</u>	<u>4,779</u>	<u>4,923</u>	<u>+ 570</u>	13.0%
Total	41,889	44,748	44,293	45,636	47,211	48,770	+ 6,881	16.4%
<b>Training operations costs (millions of dollars)</b>								
A school	120.4	138.0	147.0	144.4	146.1	137.5	+ 17.1	14.2%
C school	260.4	282.7	302.5	310.9	306.6	329.0	+ 68.6	26.3%
F school	<u>14.3</u>	<u>15.5</u>	<u>18.9</u>	<u>19.8</u>	<u>18.2</u>	<u>19.7</u>	<u>+ 5.4</u>	37.8%
Total	395.1	436.2	468.4	475.1	470.9	486.2	+ 91.1	23.1%
<b>Cost per student (dollars)</b>								
A school	4,652	5,006	5,598	5,406	5,252	4,822		
C school	22,342	22,218	22,274	21,666	20,983	20,905		
F school	3,285	3,476	4,261	4,328	3,808	4,002		
Average--all schools	9,432	9,748	10,575	10,411	9,974	9,969		

TABLE 12

## SPECIALIZED SKILL TRAINING: STUDENT/INSTRUCTOR RATIOS

	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986	Percent increase (FY 1981-86)
<b>A school</b>							
Students under instruction	25,881	27,565	26,276	26,711	27,820	28,109	8.6%
Instructors	4,035	4,327	4,529	4,533	4,517	4,543	12.6%
Student/instructor ratio	6.4:1	6.4:1	5.8:1	5.9:1	6.2:1	6.2:1	
<b>C school</b>							
Students under instruction	11,655	12,724	13,581	14,350	14,612	15,738	35.0%
Instructors	8,443	9,465	10,215	10,196	10,064	10,807	28.0%
Student/instructor ratio	1.4:1	1.3:1	1.3:1	1.4:1	1.5:1	1.5:1	
<b>F school</b>							
Students under instruction	4,353	4,459	4,436	4,575	4,779	4,923	13.0%
Instructors	48	50	58	78	92	95	97.9%
Student/instructor ratio	91.0:1	89.2:1	76.5:1	58.6:1	51.9:1	51.8:1	
<b>All schools</b>							
Students under instruction	41,889	44,748	44,293	45,636	47,211	48,770	16.4%
Instructors	12,526	13,842	14,802	14,807	14,673	15,445	23.3%
Student/instructor ratio	3.3:1	3.2:1	3.0:1	3.1:1	3.2:1	3.2:1	

TABLE 13  
SPECIALIZED SKILL TRAINING: TRENDS IN STUDENT COSTS AND  
STUDENT/INSTRUCTOR RATIOS

	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986
A school						
Cost per student (dollars)	4,652	5,006	5,598	5,406	5,252	4,821
Student/instructor ratio	6.4:1	6.4:1	5.8:1	5.9:1	6.2:1	6.2:1
C school						
Cost per student (dollars)	22,342	22,218	22,274	21,666	20,983	20,905
Student/instructor ratio	1.4:1	1.3:1	1.3:1	1.4:1	1.5:1	1.5:1
F school						
Cost per student (dollars)	3,285	3,476	4,261	4,109	3,808	4,002
Student/instructor ratio	91.0:1	89.2:1	76.5:1	58.6:1	51.9:1	51.8:1
All schools						
Cost per student (dollars)	9,432	9,748	10,575	10,411	9,974	9,969
Student/instructor ratio	3.3:1	3.2:1	3.0:1	3.1:1	3.2:1	3.2:1

training costs. The second factor that contributed to the apparent increase in training costs was inflation. To allow for this factor, constant-dollar pricing was applied in the analysis. Finally, there was a change in the financing of Navy nuclear power training which caused an increase in Navy O&MN funding. This factor was removed from the budget data in the study estimates so as to provide a more consistent content to the O&MN costs.

These policy changes added to the budget totals of the Navy and of Navy training but did not stem from changes in training activity or content. Their effect was to obscure the underlying cost trends for training.

#### Major Trends in Training Costs and Student Load

As can be seen in table 10, the costs of training, even after those major accounting adjustments, did increase. Table 11 shows a cost increase of \$91 million or 23.1 percent overall for specialized skill training, with a 26.5 percent rise in C-school costs. What table 11 also shows, however, is that the total number of students under instruction increased 16.4 percent during the five-year period, and that number in C schools increased 35 percent. Considering that the student/instructor ratio at C schools was 1.5 to 1, it is clear that the increase in training costs took place largely in C schools where the largest student load increase (and therefore the largest increase in instructors) took place. Of the \$91 million increase in overall specialized skill training costs, \$68.6 million or 76 percent occurred in C schools.

#### A Summary View of Training Costs and Student Load--FY 1981-86

An overall perspective on training costs and their direction in recent years was graphically highlighted in figure 1, which summarizes the major finding on specialized skill training costs--the costs per student. Figure 1 showed the trends in cost per student for each of the major types of schools. Figure 9 displays the trends in the student/instructor ratios. It shows that there have been only minor changes in both per-student costs and student/instructor ratios, and that the recent trends in specialized skill training costs are consistent with the trends in student load.

#### TRAINING BASE OPERATIONS COSTS--A NEXT STEP

In the course of examining and analyzing the costs of Navy training, it was possible to associate dollar and manpower resources with the overall training function fairly readily. As noted earlier, however, relating those costs to the detailed training categories posed minor problems, particularly with the costs of military manpower. Once having

identified the direct O&MN costs, military personnel costs, and investment costs that are associated with the categories of training, there is a significant residual that can only be attributed to "base support," also referred to as "base operations."

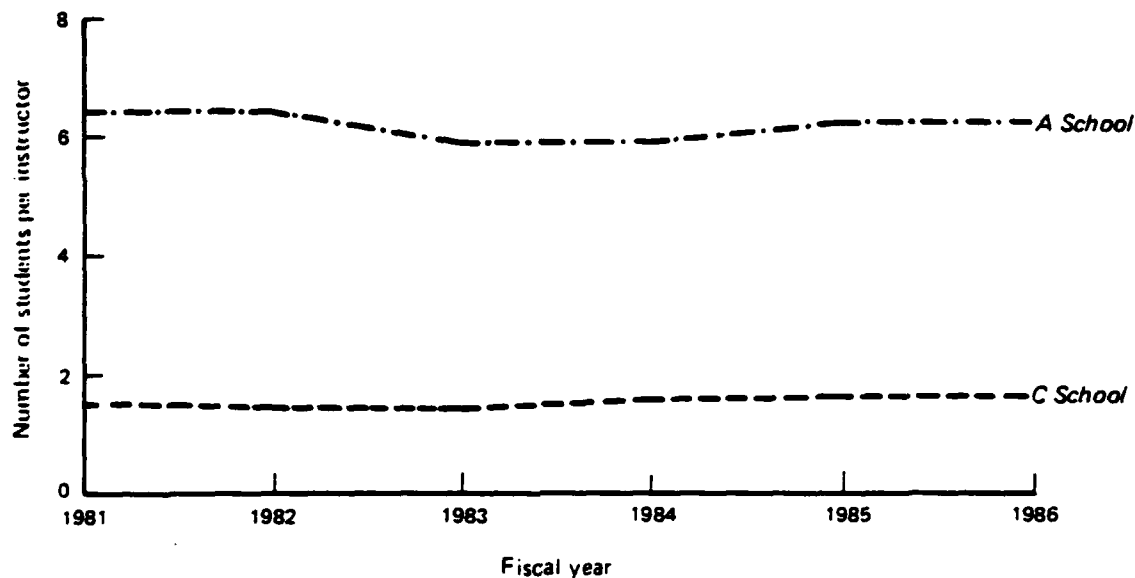


FIG. 9: SPECIALIZED SKILL TRAINING: TRENDS IN STUDENTS PER INSTRUCTOR IN A AND C SCHOOLS

#### Coverage of Base Operating Costs

"Base support" is a category that is used in presenting O&MN costs within the overall training budget; it also appears in the summary training cost tables presented earlier. Included in this category are the O&MN and manpower costs associated with operating, maintaining, and repairing the facilities used for individual training. Thus, the costs shown in the data base for each of the training categories exclude the cost of the facilities in which the training is conducted. This means that a significant share of the Navy training costs, covering the entire Navy training mission, are contained in the "base support" category.

#### Estimated Base Operations and Training Missions Costs

Some appreciation of these resources can be seen in table 14, which estimates the overall costs for each category of individual training for FY 1986 by major cost category. Base support amounted to \$706 million in FY 1986, which is about 14 percent of the total operating resources

for training. That amount represents the aggregate facility costs of conducting the recruit, specialized skill, flight, officer acquisition, health care, and professional education and development training. Such an aggregation of the training costs, unrelated to the student load and the direct instructional costs, leaves much to be desired. Unfortunately, the data systems currently available do not produce information that permits the identification of those facility costs at the same level of aggregation that is used to identify the direct manpower and O&MN costs presented earlier in this report.

TABLE 14

TOTAL COSTS OF NAVY TRAINING--ALL APPROPRIATIONS, FY 1986  
(Millions of FY 1986 dollars)

<u>Training category</u>	<u>Total operating costs</u>	<u>Total investment costs</u>	<u>Total</u>
Recruit training	526.0	0	526.0
Specialized skill training	1,664.8	588.1	2,252.9
Flight training	647.6	298.3	945.9
Officer acquisition	258.6	--	258.6
Health care training	167.3	--	167.3
Professional education and development	153.7	--	153.7
Educational development programs	83.4	--	83.4
Training support	678.7	334.4	1,013.1
Base support	706.0	--	706.0
PCS travel	<u>168.3</u>	<u>--</u>	<u>168.3</u>
Total	5,054.4	1,220.8	6,275.2

Base Operations Costs and Data Identification

Discussions with program and budget staffs within the training community indicate that the association of base support costs with the individual training categories would enhance the presentation of the training programs and budgets and provide better support for base operations budgets by presenting them in terms of the training missions being conducted. It would make available a more complete cost picture for each type of training that would relate student base loading as a factor in base operating costs. It would also better relate the aggregate of base facility costs to the training mission.

#### Allocation of Base Operations Costs to Training Categories

Some appreciation of significance of base operating costs in relation to the total costs of training can be gained by reference to table 15, which is also graphically displayed in figures 10 and 11. These represent approximations of the FY 1986 total costs of flight training and specialized skill training, including an estimated share of related base operations costs. These estimates were derived by using the association of resources with OPNAV resource sponsors as an indicator of the type of base operations costs involved. OP-05 resources in the base operations category, for example, would fall largely under flight training, with a separate share allocated to aviation maintenance training within specialized skill training.

#### Future Research Into Training Base Operations Costs

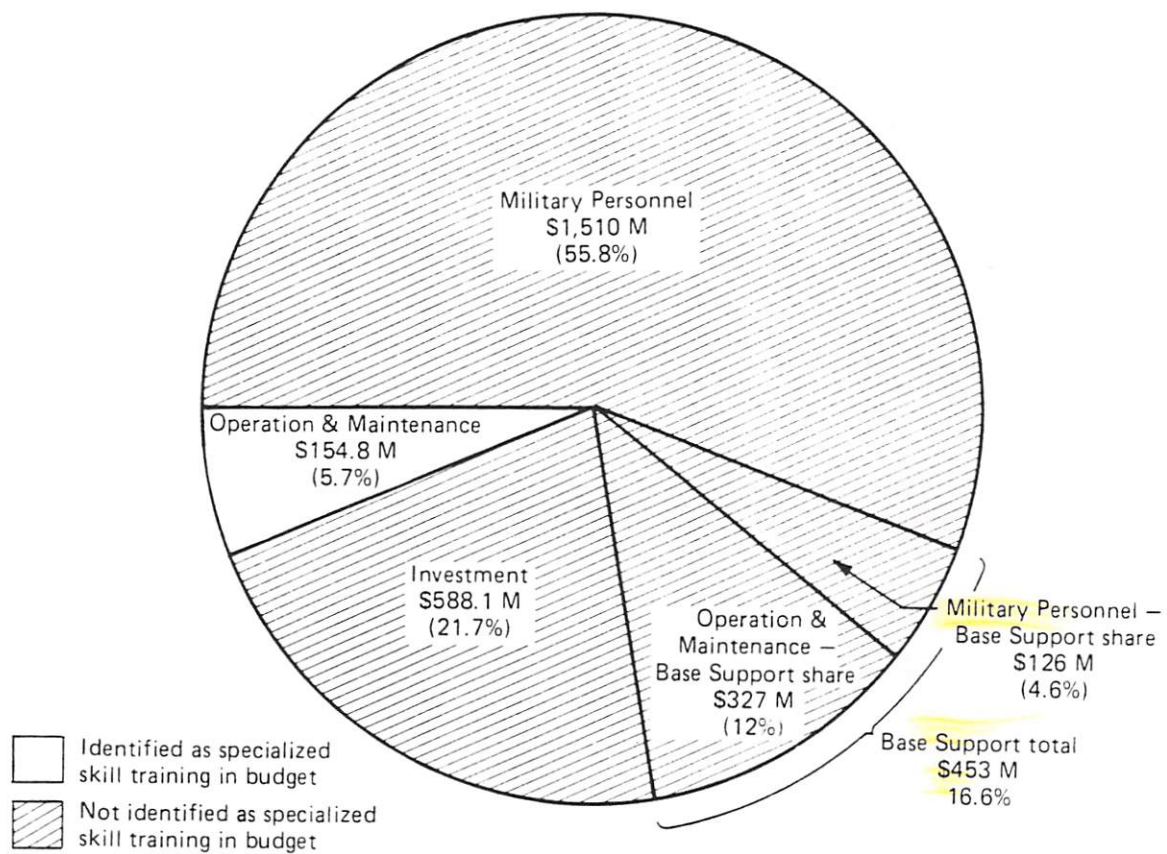
Discussions with staff at the functional training commands indicate that they want to improve their programming and budgeting by associating costs with the individual training missions, and that the requisite data to achieve that end can be gathered.

TABLE 15

TRAINING ACTIVITIES AND RELATED BASE OPERATIONS COSTS FOR FY 1986  
(Millions of dollars)

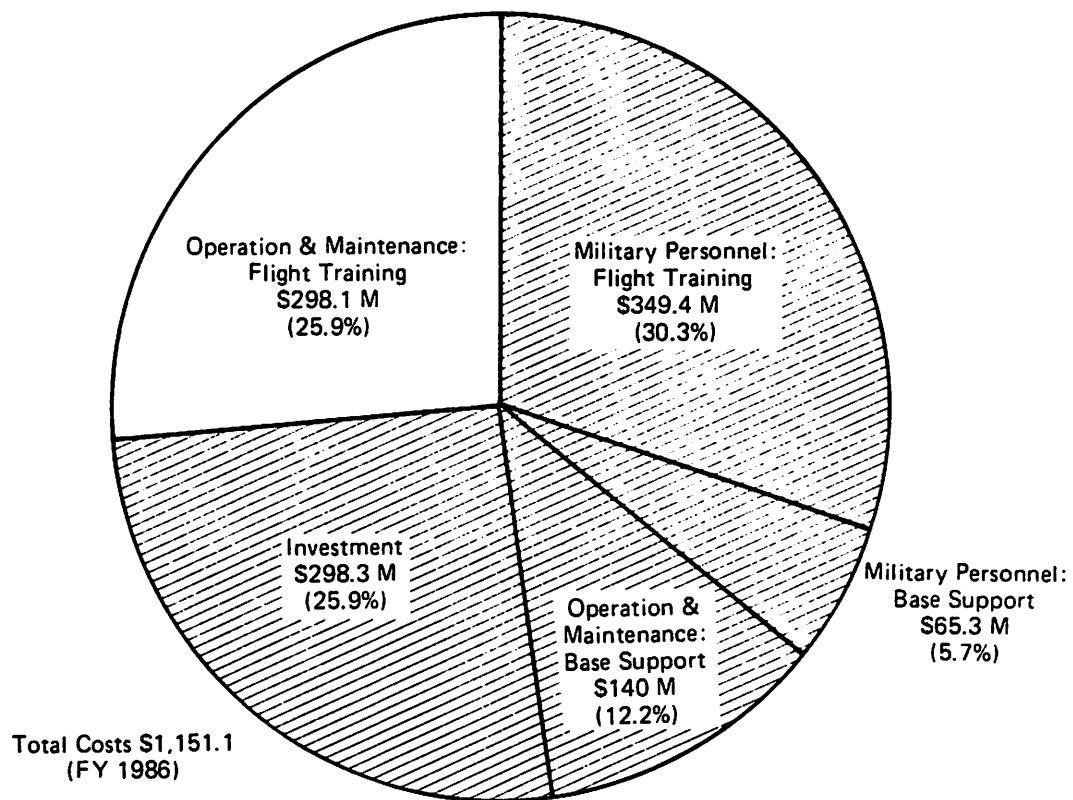
	Identified costs	Costs included in base operations	Percent of total included in base operations	Total costs
Specialized skill training				
O&MN	154.8	327.0 <sup>a</sup>	68	481.8
MPN/RPN	1,510.0	126.0 <sup>a</sup>	8	1,636.0
Investment	588.1	--	0	588.1
Total	2,252.9	453.0	17	2,705.9
Flight Training				
O&MN	298.1	140.0 <sup>a</sup>	32	438.1
MPN/RPN	349.4	65.3 <sup>a</sup>	16	414.7
Investment	298.3	--	0	298.3
Total	945.8	205.3	18	1,151.1

a. Numbers are approximated.



(Includes approximations of base operating cost share for specialized skill training.)

FIG. 10: COSTS OF NAVY SPECIALIZED SKILL TRAINING



Identified as training in the budget

Not identified as training in the budget

(Includes approximations of base operating cost share for flight training)

FIG. 11: COSTS OF NAVY FLIGHT TRAINING

#### REFERENCE

- [1] CNA Research Memorandum 86-174, "Specialized Skill Training and Personnel Retention as Factors Impacting Training Costs: Summary Report," by Aline O. Quester, Aug 1986